

## **Elementary Teachers' Reports of Their Mathematics Instruction Before and During the COVID-19 Pandemic**

Babette Moeller<sup>1</sup>, Teresa Duncan<sup>2</sup>, Jason Schoeneberger<sup>3</sup>, and John Hitchcock<sup>4</sup>

<sup>1</sup>Education Development Center

<sup>2</sup>Deacon Hill Research Associates

<sup>3</sup>ICF

<sup>4</sup>Westat

January 7, 2022

### **Author Note**

This paper was developed with funding from a grant from the U.S. Department of Education (grant number [U411B180037](#)). The contents of this paper do not necessarily represent the policy or views of the U.S. Department of Education, nor do they imply endorsement by the U.S. Department of Education.

Suggested citation: Moeller, B., Duncan, T., Schoeneberger, J., & Hitchcock, J. (2022, January). *Elementary teachers' reports of their mathematics instruction before and during the COVID-19 pandemic*. Paper presented at the annual research conference of the National Council of Teachers of Mathematics (virtual event).

Correspondence regarding this paper should be addressed to Babette Moeller, Education Development Center, 96 Morton Street, 7<sup>th</sup> Floor, New York, NY 10014, United States. Email: [bmoeller@edc.org](mailto:bmoeller@edc.org)

## **Abstract**

As part of a federally funded grant, we conducted Math for All professional development workshops at elementary schools in the Midwest to support teachers' implementation of high-quality, standards-based mathematics education for a wide range of students, including those with disabilities. Our research included week-long instructional logs administered during the 2019–20 and 2020–21 school years. These instructional logs from a small sample of K–5 teachers (n=22 at three rural districts, and n=53 at one urban district) help describe the nature of mathematics instruction and teachers' lesson planning practices prior to the COVID-19 crisis (October 2019–early March 2020) and during the pandemic (April–May 2020 and during the 2020–21 school year). Our findings demonstrate the need for more support for teachers in the areas of lesson planning and differentiating instruction to enable them to be more flexible and to be better prepared to address diverse students' needs under challenging instructional conditions.

*Keywords:* mathematics instruction, COVID-19, instructional time, lesson planning, differentiating instruction

## **Introduction**

Our team was awarded a grant from the U.S. Department of Education in fall 2018, which allowed us to provide Math for All (MFA) professional development (PD) workshops to in-service teachers in grades K through 5. MFA consists of five one-day workshops and classroom-based assignments, providing a total of 40 hours of PD. The MFA program uses a lesson-study approach, engaging teams of general and special education teachers to collaboratively plan and adapt mathematics lessons to support the achievement of all students, including those with disabilities. Implementation began in summer 2019, and data collection began in fall 2019.

Instructional logs focusing on mathematics instruction are a key component of our project's research plan. The logs are intended to capture teachers' instructional practices, lesson planning activities, and lesson adaptations. Logs were administered at approximately one-month intervals, and asked teachers to report on math instruction that took place during the targeted weeks. During the 2019–20 school year, we administered seven logs in the rural districts (October 2019–May 2020), and five logs in the urban district (November 2019–March 2020). We were not allowed to conduct research activities in the urban district during the period of school closures and emergency remote instruction (April–May 2020), but we were allowed to continue administering the instructional logs at the three rural districts.

The data reported here are based on 75 teachers at 15 schools (4 schools at three rural districts and 11 schools at the urban district) who submitted logs at all time points during the 2019–20 and 2020–21 school years. A total of 22 teachers from the three rural districts contributed to all 12 logs administered during those two school years. A total of 53 teachers from the urban district contributed to all 9 logs administered during those two school years. We recognize that this sample may not be representative of rural and urban districts, but that limitation is offset by the benefit of having data on the same teachers over multiple points in time, allowing us to document the trajectory of instructional practices prior to and during the COVID-19 pandemic.

## Results and Discussion

### Mathematics Instruction Time Decreased During Periods of Emergency Remote and Hybrid Instruction

Emergency remote instruction during the early months of the pandemic strongly and negatively affected math instruction time (see Figure 1 and Table 1). Despite the small sample size at the three rural districts, these data are consistent with the results of [surveys conducted by the EdWeek Research Center](#) during that same period.

Looking across the 2019–20 and 2020–21 school years, the average math instruction time reported by teachers was higher in the urban district than at the three rural districts. However, compared to the prior school year, in 2020–21 the levels of math instruction dropped (and seemed on a continuing downward trajectory) at the urban district, but increased at the rural districts, which regained levels similar to pre-COVID math instruction time. We note that in the urban district, remote instruction continued in the 2020–21 school year, while the three rural districts did return to in-person instruction, with some students joining remotely. These data show that adapting instruction to a remote mode continued to affect the instructional time available for mathematics instruction.

### Mathematics Instructional Practices Shifted After the COVID-19 Pandemic

The log data also show how the nature of mathematics instruction changed after the onset of COVID-19. As shown in Figure 2 and Table 2, teachers were markedly less likely during the 2020–21 school year to use small-group instruction in mathematics (e.g., “Have students solve problems and discuss mathematics in small groups” and “Group students so they can provide peer support”). These data suggest that teachers were struggling with how to use small-group work as a mathematics instructional strategy, both in remote (online) learning environments and in socially distanced and masked classrooms. The amount of time teachers engaged in specific lesson planning practices also dropped (Figure 3 and Table 3).

### Mathematics Lessons Were Shorter But Required More Planning Time

Although teachers spent less time teaching mathematics (Figure 1 and Table 1) and in specific lesson planning activities to prepare for math instruction (Figure 3 and Table 3), when overall preparation time is examined as a ratio relative to instructional time, planning time actually increased (Figure 4 and Table 4) during periods of emergency remote instruction (rural districts, April–May 2020) and remote instruction (urban district, 2020–21 school year). Given the guidance teachers were given and the limitations associated with an underdeveloped infrastructure for remote instruction, these results are not surprising. Teachers spent less time teaching mathematics, yet more time for planning (relative to length of math lessons) was required, demonstrating the realities of the effort needed to switch teaching modes from in-classroom to remote instruction. This was especially true among the rural teachers. And although urban teachers reported spending more time on lesson planning *overall*, they spent less time on specific lesson-planning practices that facilitate differentiation of instruction. These findings suggest a shift from more student-centered to more teacher-centered mathematics instructional pedagogy during the pandemic.

### **Differentiating Instruction for Diverse Learners Appeared to be a Challenge During Emergency Remote and Hybrid Instruction**

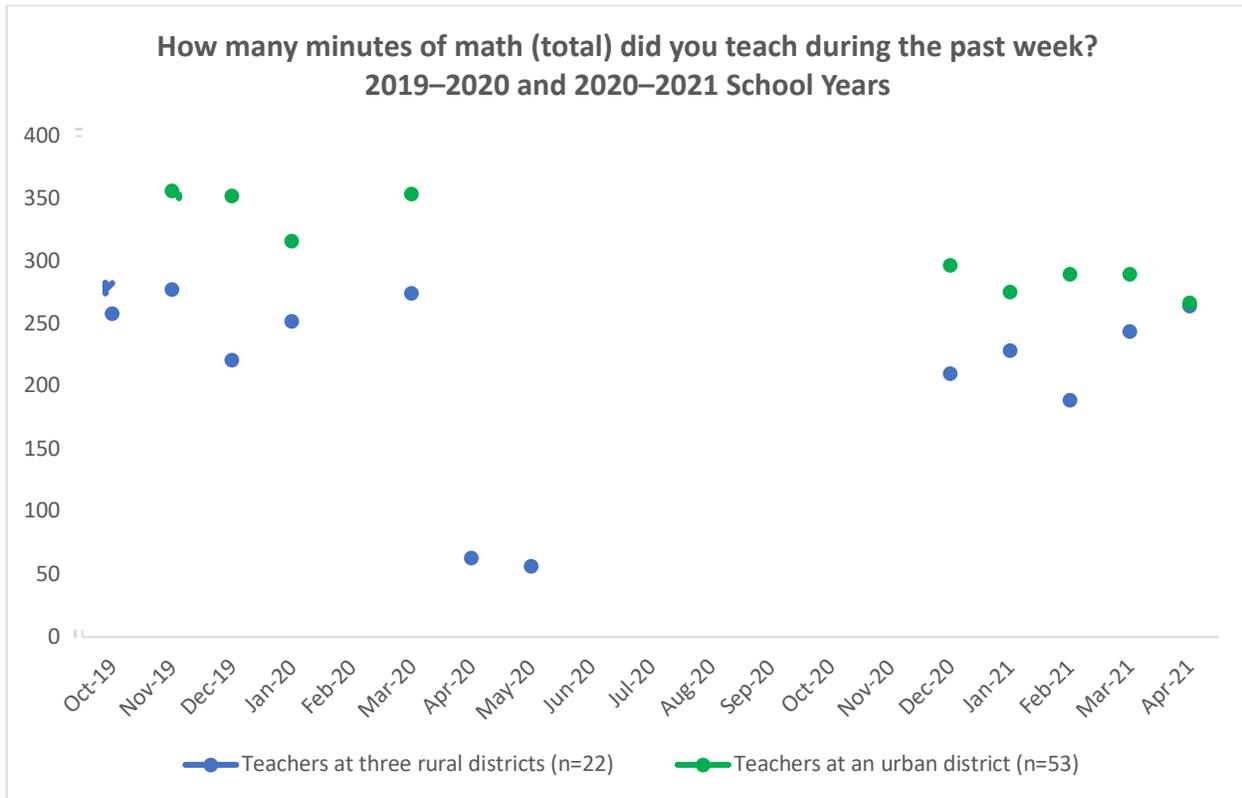
As shown previously, once the COVID-19 pandemic began, teachers were less likely to use instructional practices related to small-group instruction (Figure 2 and Table 2) or engage in lesson planning practices (Figure 3 and Table 3). It is important to note that many of the lesson planning practices relate to differentiating instruction to address the needs of diverse learners. Figure 5 corroborates the data in Figure 3 and Table 3. After the pandemic began, teachers were less likely to make changes or adaptations to the lessons from their textbooks or curricula to better address the strengths and needs of diverse learners (Figure 5). In addition, most teachers who did make changes or adaptations encountered difficulties doing so. The fewer adaptations and the difficulties in making adaptations may in part be due to the limited feedback from students upon which teachers could base adaptations (e.g., via informal observations).

These results provide additional empirical evidence about how the COVID-19 pandemic affected teachers' instructional practices over the course of two school years. Our findings demonstrate the need for more support for teachers in the areas of lesson planning and differentiating instruction, to enable them to be more flexible and to be better prepared to address diverse students' needs under challenging instructional conditions.

# MATHEMATICS INSTRUCTION BEFORE AND DURING COVID

**Figure 1**

*Mathematics Instruction Time*



**Table 1**

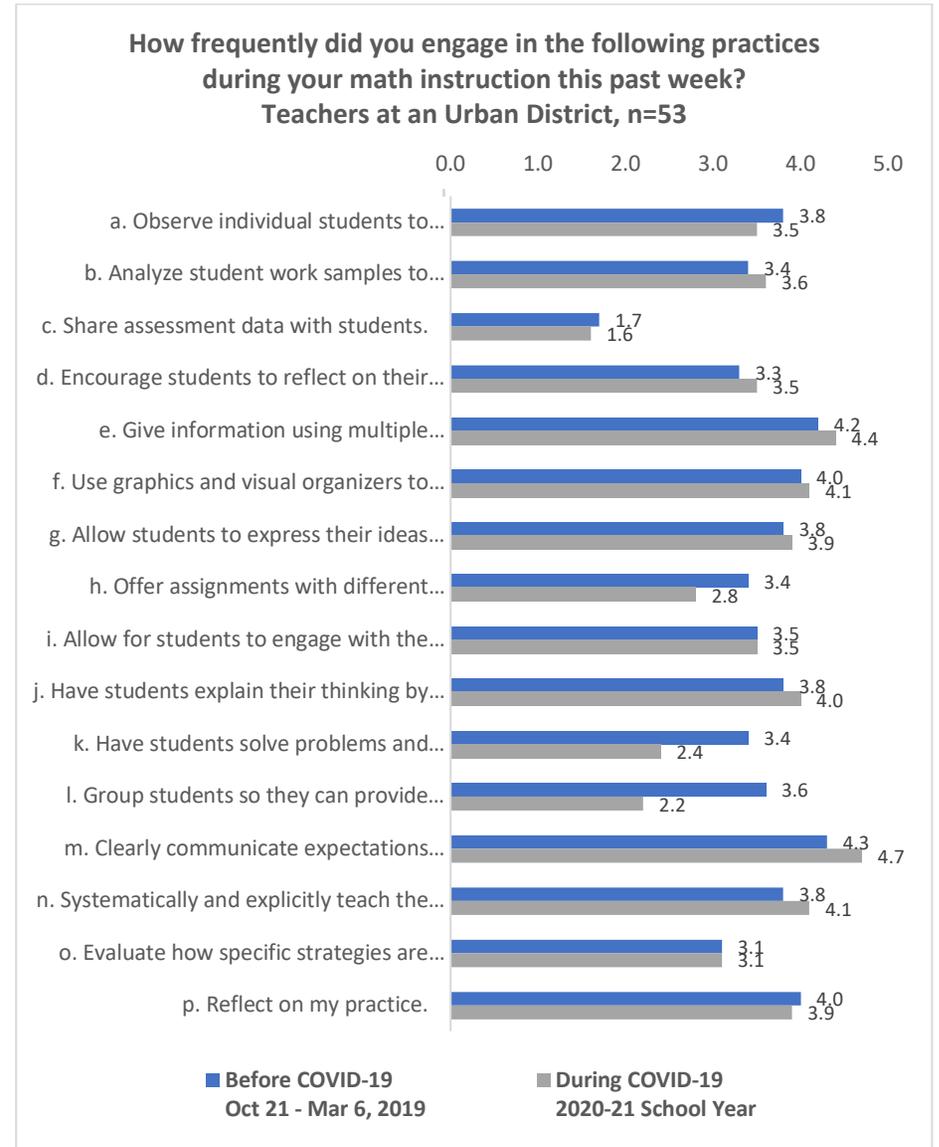
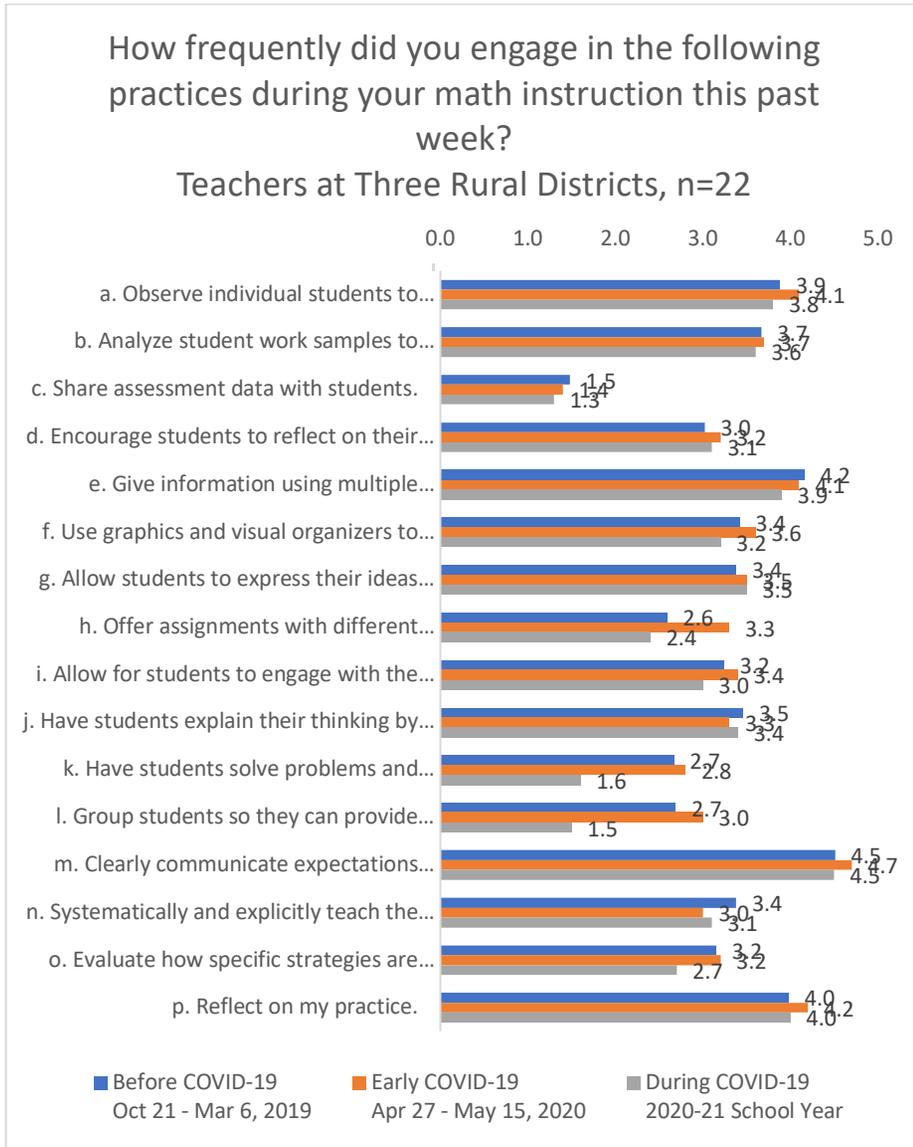
*Mathematics Instruction Time*

How many minutes of math (total) did you teach during the past week?	Teachers at three rural districts (n=22)	Teachers at an urban district (n=53)
Oct-19	258.1	(no log administered)
Nov-19	277.2	356.1
Dec-19	221.2	351.9
Jan-20	251.9	315.9
Early Mar-20	274.4	353.4
Apr-20	62.8	(log cancelled)
May-20	56.3	(log cancelled)
Dec-20	210.5	296.8
Jan-21	228.6	275.2
Feb-21	188.8	289.6
Mar-21	243.9	289.5
Apr-21	264.3	266.7

# MATHEMATICS INSTRUCTION BEFORE AND DURING COVID

**Figure 2**

*Teachers' Reports of Mathematics Instructional Practices at Three Rural and One Urban District*



MATHEMATICS INSTRUCTION BEFORE AND DURING COVID

**Table 2**

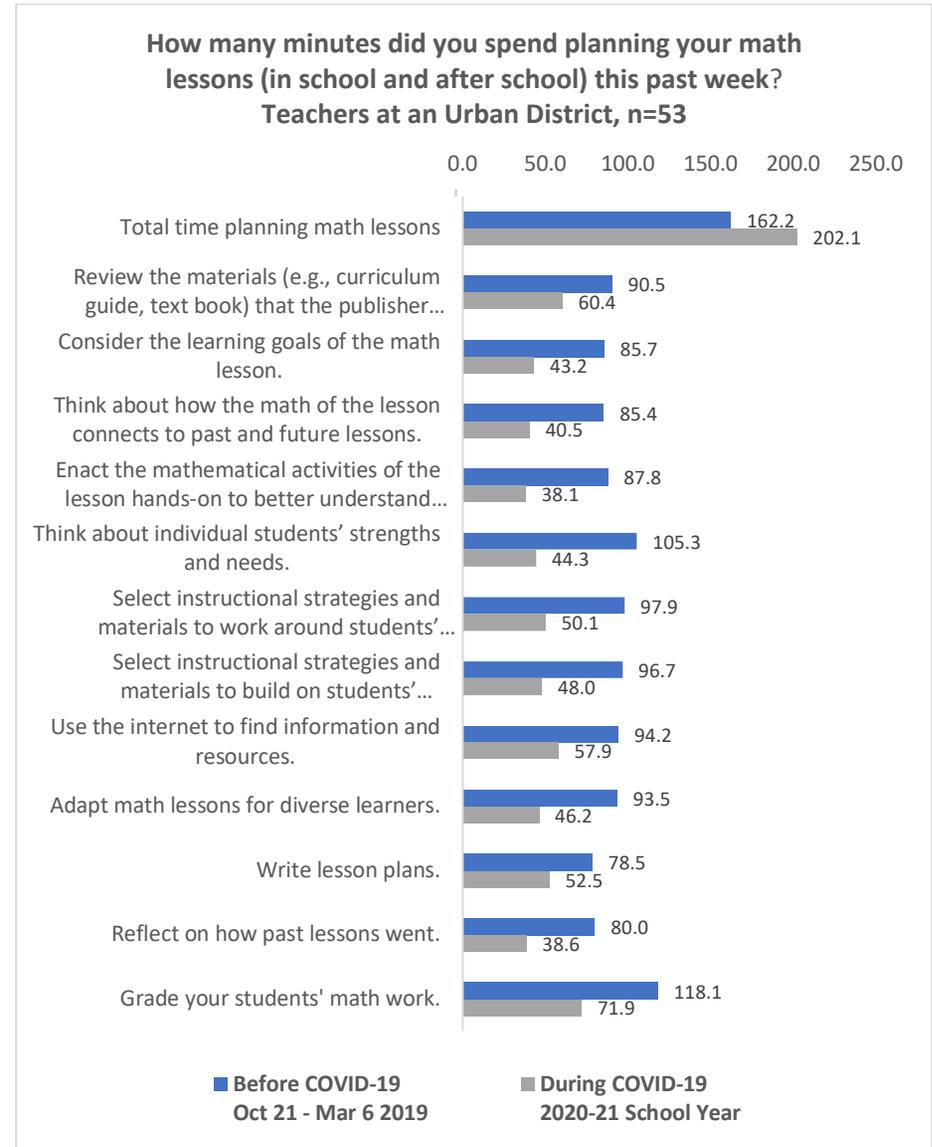
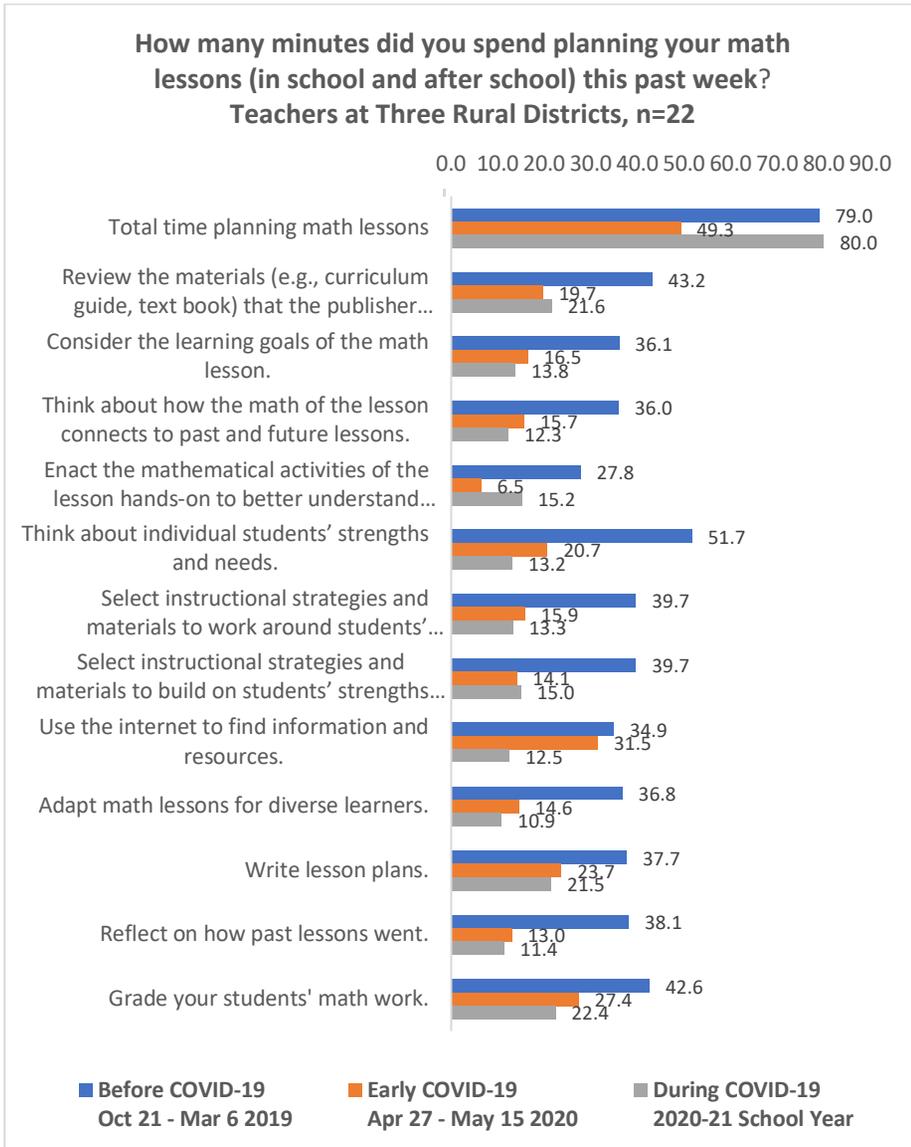
*Teachers' Reports of Mathematics Instructional Practices at Three Rural and One Urban District*

MATHEMATICS INSTRUCTIONAL PRACTICES	TEACHERS AT THREE RURAL DISTRICTS (N=22)			TEACHERS AT AN URBAN DISTRICT (N=53)	
	Before COVID-19 Oct 21–Mar 6, 2019	Early COVID-19 Apr 27–May 15, 2020	During COVID-19 2020–21 School Year	Before COVID-19 Oct 21–Mar 6, 2019	During COVID-19 2020–21 School Year
<b>How frequently did you engage in the following practices during your math instruction this past week? (0=Never; 1=Once; 2=Twice; 3=Three Times; 4=Four Times; 5=Daily)</b>					
a. Observe individual students to identify strengths and needs.	3.9	4.1	3.8	3.8	3.5
b. Analyze student work samples to identify strengths and needs.	3.7	3.7	3.6	3.4	3.6
c. Share assessment data with students.	1.5	1.4	1.3	1.7	1.6
d. Encourage students to reflect on their learning.	3.0	3.2	3.1	3.3	3.5
e. Give information using multiple modalities (e.g., visual, verbal, written).	4.2	4.1	3.9	4.2	4.4
f. Use graphics and visual organizers to represent math concepts and problems.	3.4	3.6	3.2	4.0	4.1
g. Allow students to express their ideas in multiple modalities.	3.4	3.5	3.5	3.8	3.9
h. Offer assignments with different levels of difficulty for different students.	2.6	3.3	2.4	3.4	2.8
i. Allow for students to engage with the lesson materials in multiple ways.	3.2	3.4	3.0	3.5	3.5
j. Have students explain their thinking by talking, writing, or drawing the steps they used in solving a problem.	3.5	3.3	3.4	3.8	4.0
k. Have students solve problems and discuss mathematics in small groups.	2.7	2.8	1.6	3.4	2.4
l. Group students so they can provide peer support.	2.7	3.0	1.5	3.6	2.2
m. Clearly communicate expectations for learning.	4.5	4.7	4.5	4.3	4.7
n. Systematically and explicitly teach the steps and strategies for problem solving.	3.4	3.0	3.1	3.8	4.1
o. Evaluate how specific strategies are working for individual students.	3.2	3.2	2.7	3.1	3.1
p. Reflect on my practice.	4.0	4.2	4.0	4.0	3.9

# MATHEMATICS INSTRUCTION BEFORE AND DURING COVID

**Figure 3**

*Teachers' Reports of Time Spent on Lesson Planning Practices at Three Rural and One Urban District*



MATHEMATICS INSTRUCTION BEFORE AND DURING COVID

**Table 3**

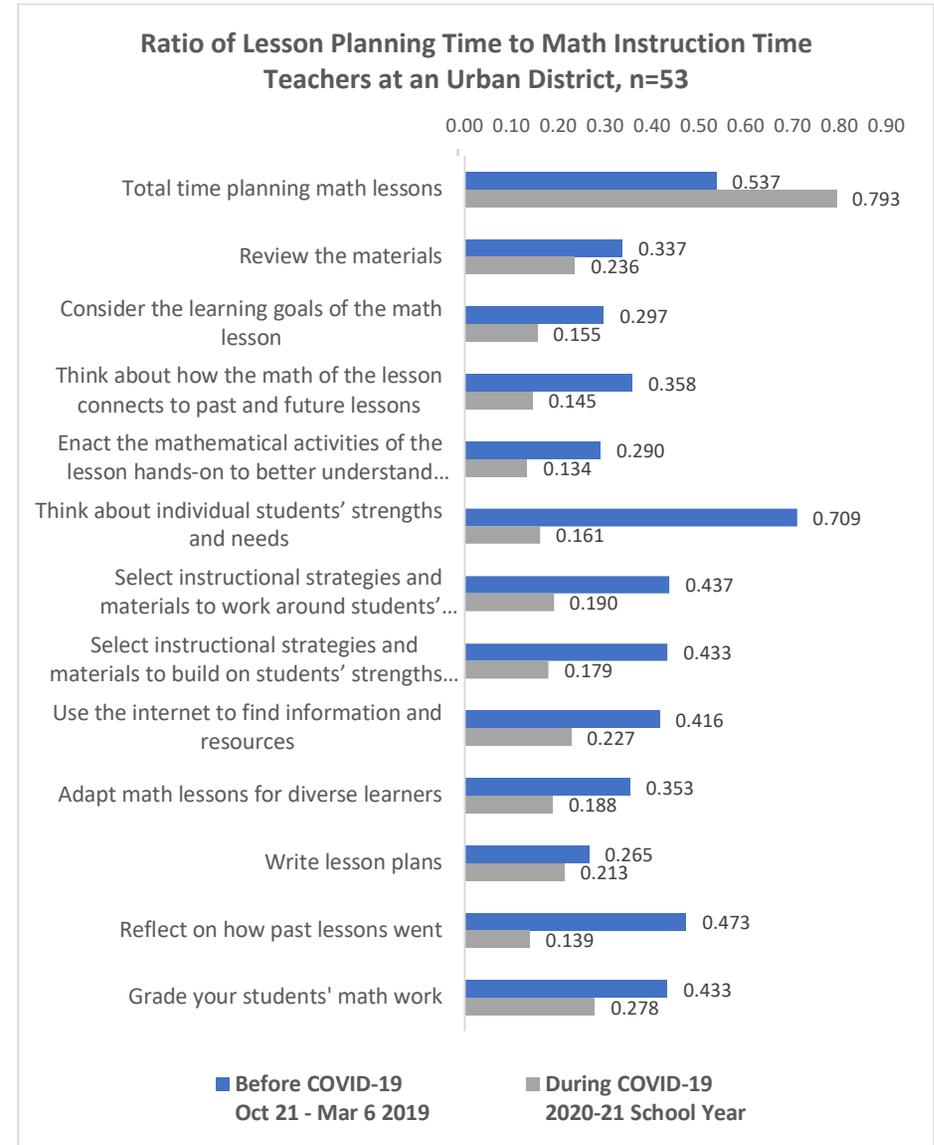
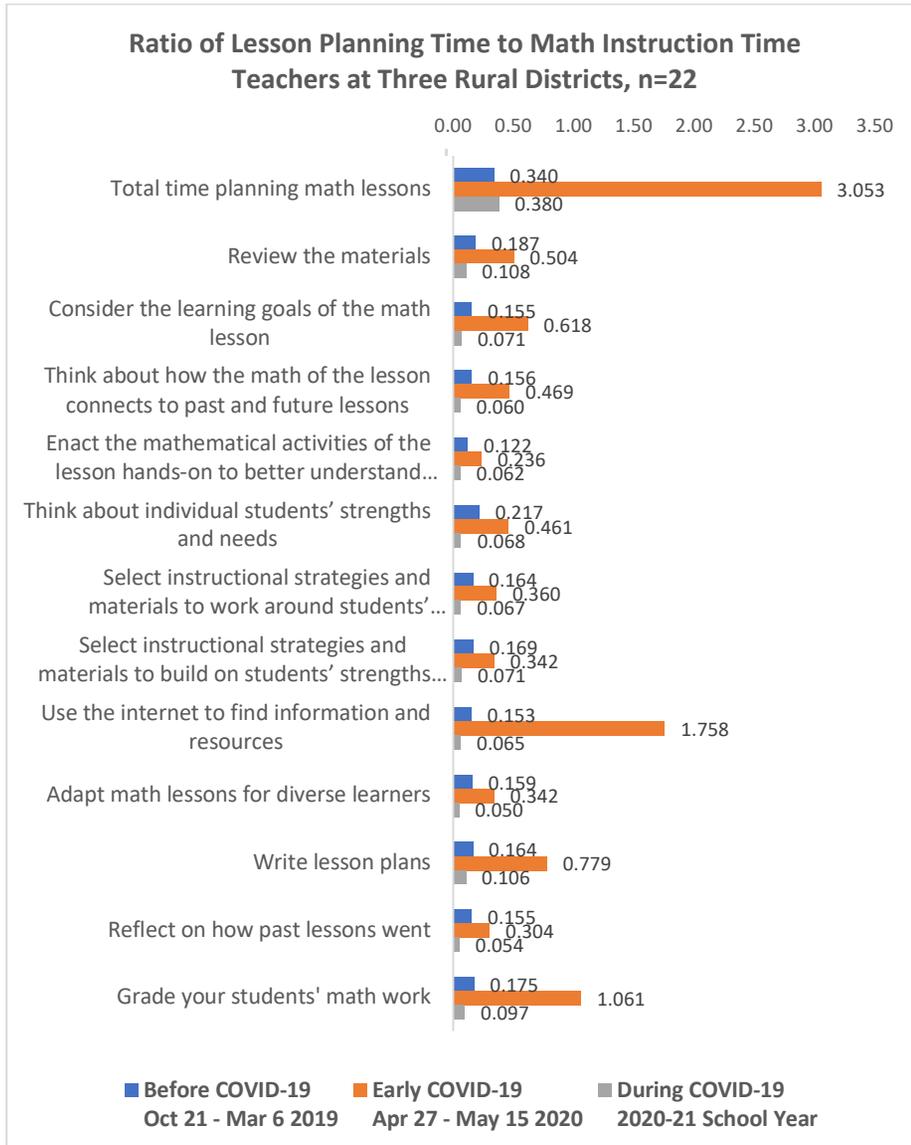
*Teachers' Reports of Time Spent on Lesson Planning Practices at Three Rural and One Urban District*

LESSON PLANNING PRACTICES	TEACHERS AT THREE RURAL DISTRICTS (N=22)			TEACHERS AT AN URBAN DISTRICT (N=53)	
	Before COVID-19 Oct 21–Mar 6, 2019	Early COVID-19 Apr 27–May 15, 2020	During COVID-19 2020–21 School Year	Before COVID-19 Oct 21–Mar 6, 2019	During COVID-19 2020–21 School Year
<b>How much time did you spend planning your math lessons (in school and after school) this past week?</b>					
<b>Total time planning math lessons</b>	79.0	49.3	80.0	162.2	202.1
a. Review the materials (e.g., curriculum guide, text book) that the publisher provides.	43.2	19.7	21.6	90.5	60.4
b. Consider the learning goals of the math lesson.	36.1	16.5	13.8	85.7	43.2
c. Think about how the math of the lesson connects to past and future lessons.	36.0	15.7	12.3	85.4	40.5
d. Enact the mathematical activities of the lesson hands-on to better understand the demands.	27.8	6.5	15.2	87.8	38.1
e. Think about individual students' strengths and needs.	51.7	20.7	13.2	105.3	44.3
f. Select instructional strategies and materials to work around students' areas of need.	39.7	15.9	13.3	97.9	50.1
g. Select instructional strategies and materials to build on students' strengths to help them improve in their areas of need.	39.7	14.1	15.0	96.7	48.0
h. Use the internet to find information and resources.	34.9	31.5	12.5	94.2	57.9
i. Adapt math lessons for diverse learners.	36.8	14.6	10.9	93.5	46.2
j. Write lesson plans.	37.7	23.7	21.5	78.5	52.5
k. Reflect on how past lessons went.	38.1	13.0	11.4	80.0	38.6
l. Grade your students' math work.	42.6	27.4	22.4	118.1	71.9

# MATHEMATICS INSTRUCTION BEFORE AND DURING COVID

**Figure 4**

*Ratio of Lesson Planning Time to Math Instruction Time*



MATHEMATICS INSTRUCTION BEFORE AND DURING COVID

**Table 4**

*Ratio of Lesson Planning Time to Math Instruction Time*

RATIO OF LESSON PLANNING PRACTICES RELATIVE TO INSTRUCTIONAL TIME	TEACHERS AT THREE RURAL DISTRICTS (N=22)			TEACHERS AT AN URBAN DISTRICT (N=53)	
	Before COVID-19 Oct 21–Mar 6, 2019	Early COVID-19 Apr 27–May 15, 2020	During COVID-19 2020–21 School Year	Before COVID-19 Oct 21–Mar 6, 2019	During COVID-19 2020–21 School Year
How much time did you spend planning your math lessons (in school and after school) this past week?					
<b>Total time planning math lessons</b>	0.340	3.053	0.380	0.537	0.793
a. Review the materials (e.g., curriculum guide, text book) that the publisher provides.	0.187	0.504	0.108	0.337	0.236
b. Consider the learning goals of the math lesson.	0.155	0.618	0.071	0.297	0.155
c. Think about how the math of the lesson connects to past and future lessons.	0.156	0.469	0.060	0.358	0.145
d. Enact the mathematical activities of the lesson hands-on to better understand the demands.	0.122	0.236	0.062	0.290	0.134
e. Think about individual students' strengths and needs.	0.217	0.461	0.068	0.709	0.161
f. Select instructional strategies and materials to work around students' areas of need.	0.164	0.360	0.067	0.437	0.190
g. Select instructional strategies and materials to build on students' strengths to help them improve in their areas of need.	0.169	0.342	0.071	0.433	0.179
h. Use the internet to find information and resources.	0.153	1.758	0.065	0.416	0.227
i. Adapt math lessons for diverse learners.	0.159	0.342	0.050	0.353	0.188
j. Write lesson plans.	0.164	0.779	0.106	0.265	0.213
k. Reflect on how past lessons went.	0.155	0.304	0.054	0.473	0.139
l. Grade your students' math work.	0.175	1.061	0.097	0.433	0.278

MATHEMATICS INSTRUCTION BEFORE AND DURING COVID

**Figure 5**

*Adapting Lessons to Better Address the Strengths and Needs of Diverse Learners (% Yes)*

